



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Doak et al. : Group Art Unit: 2822
 Serial No.: 09/887,777 : Examiner: Parviz Hassanzadeh
 Filed: June 22, 2001 :
 Title: **Method and Apparatus for Preparing Nitride Semiconductor Surfaces**

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Mail Stop Non-Fee Amendment
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, VA 22313-1450

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RESPONSE TO OFFICIAL ACTION

Mail Stop Non-Fee Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is in response to the Official Action dated March 17, 2003. Each of the claims now present in the application being examined at this time have been rejected. Independent claim 12 has been rejected as anticipated by Cappelli et al. under 35 U.S.C. § 102(b) for the first time. The previously stated rejection of claim 1, which the examiner has indicated was stated in error in the first Official Action, has now been withdrawn. The remaining rejections of claims 12 - 18 and 36 - 52 appear identical to the rejections of claims 12 - 18 and 36 - 38 in the first Official Action. In the Response to Arguments in the outstanding Official Action, the examiner states that applicants' arguments "have been fully considered but they are not persuasive." The examiner however has not commented on the most salient of the distinguishing features of the claims as pointed out in applicants' amendment filed February 14, 2003. Each of the rejections in the outstanding Official Action, it is urged, is in error and should be withdrawn.

Independent Claim 12

Independent claim 12 has been newly rejected as anticipated by Cappelli et al. However independent claim 12, as amended February 14, 2003, contains the recitation "means to locate a substrate along the nitrogen delivery path downstream of the location at which the electrodes produce the corona discharge ... at a location sufficiently distant from the corona-discharge

producing electrodes such that essentially the only activated nitrogen impinging on the substrate is $N_2A^3\Sigma_u^+$."

In the response to the Official Action of February 14, 2003 applicant pointed out:

As presently amended, claim 12 calls for the distance from the corona formation to the substrate being such that substantially the only activated nitrogen molecules at that location are of the form $N_2A^3\Sigma_u^+$. This is not taught by either the Hinchliffe patent or the Cappelli et al. article.

The outstanding Official Action never addresses this distinction. Claim 12 is clearly not anticipated by Cappelli et al.

Independent claim 12 is further rejected in the Official Action identically as previously as unpatentable over Hinchliffe in view of Cappelli et al. under 35 U.S.C. §103. The above quoted language from claim 12 again distinguishes that claim from both Hinchliffe and Cappelli et al. and as previously pointed out in the response of February 14, 2003, the two references cannot be combined to provide what can be found in neither. Such a rejection without some further teaching is improper. Withdrawal of the rejection of claim 12 as anticipated by Cappelli et al. and as obvious over Hinchliffe and Cappelli et al. should be withdrawn, it is urged.

Dependent Claim 13

Claim 13 is dependent from claim 12 and is patentable with claim 12. The location of the "means to locate a substrate along the nitrogen delivery path" as quoted above is incorporated in claim 13 by its dependency. Neither Hinchliffe nor Cappelli et al. teach the location of the means to locate a substrate as recited and the two references cannot be combined to provide that which neither teaches or suggests. Claim 13 should be allowed at this time.

Dependent claims 14 - 18

Dependent claims 14 - 18 include by their dependency the recitations of claims 13 and 12. Claims 14, 15, 17 and 18 are rejected over the combination of Hinchliffe, Cappelli et al. and Yamauchi et al. just as in the previous Official Action. As was stated in the response filed February 14, 2003 in relation to these claims:

Like Hinchliffe and Cappelli et al., Yamauchi et al. fail to teach the location

of the target substrate sufficiently distant from a corona discharge as to cause application of substantially only molecules, or even single atoms, having the $A^3\Sigma_u^+$ state. Consequently, by virtue of their dependence, claims 14, 15, 17 and 18 are patentable over the combination of Hinchliffe, Cappelli et al. and Yamauchi et al. since these cannot be combined to provide what is nowhere taught in any of the three cited references.

This continues to be the case. The outstanding Official Action does not address this distinction. Allowance of these claims at this time is appropriate.

Regarding the rejection of claim 16 over Hinchliffe, Cappelli et al., Yamauchi et al. and Bachir et al., it is noted that the Bachir et al. article provides no teaching of the location of the substrate support or "means to locate" as recited in claim 12 and quoted above. Hence, absent some teaching of this important feature of the invention, claim 16 is patentable over Hinchliffe, Cappelli et al. Yamauchi et al. and Bachir et al.

Independent Claim 36

Independent claim 36 calls for:

(e) means for locating a target semiconductor substrate in the path of the collimated jet of nitrogen particles at a distance from the means for establishing a corona discharge such that substantially only diatomic nitrogen molecules of the form $N_2A^3\Sigma_u^+$ and $N_2X^1\Sigma_g^+$ are present at that distance.

In the outstanding Official Action, claim 36 has again been rejected along with claims 14, 15, 17, 18 and 37 - 52 as unpatentable over Hinchliffe, Cappelli et al. and Yamauchi et al. under 35 U.S.C. § 103(a). As was pointed out in the response filed February 14, 2003:

In the same way as the preceding claims, claims 36 through 38 patentably differ from Hinchliffe, Cappelli et al. and Yamauchi et al. taken individually or combined. Their rejection is now moot, it is urged. Unlike the three cited references, claim 36 makes it clear that diatomic nitrogen molecules of the form $N_2A^3\Sigma_u^+$ and $N_2X^1\Sigma_g^+$ are substantially the only nitrogen states at the location of the substrate. By their dependency, claims 37 and 38 are patentable on this basis, as well.

This continues to be true. Without some teaching of the recitation of claim 36, that claim is clearly patentable over the three relied-upon references and should be allowed at this time.

Dependent Claims 37 - 46

Dependent claims 37 - 46, by their dependency, include each of the limitations of claim 36 and are patentable therewith. Each of these claims incorporate by their dependency the above quoted recitation (e) lacking in the prior art. Hinchliffe, Cappelli et al. and Yamauchi et al. cannot be combined to provide what cannot be found in any one of those references. There is no possibility of any such combination. Consequently the combination cannot be obvious. Claims 37 - 46 should be allowed at this time.

Independent Claim 47

Claim 47 recites:

(f) a substrate location downstream of the skimmer, in operation locating a substrate for formation thereon a dielectric film composed at least in part of the reagent,

As was pointed out in the response filed February 14, 2003:

Claims 47 - 52 specifically set forth the production of an insulator film on the substrate, unlike the prior art of record. Claim 47, and claims 48 - 52, dependent from claim 47, are patentable over the art of record.

The outstanding Official Action does not address this distinction at all. Claim 47 clearly is allowable over the art of record.

Dependent Claims 48 - 52

Claims 48 - 52 by their dependency include the above quoted provision of claim 47, not found in the art of record. These claims, then, are patentable over Hinchliffe, Cappelli et al. and Yamauchi et al. like their parent claim 47. Allowance of these claims at this time is respectfully requested.

Conclusion

Each of the claims in this application are patentable over the cited art, it is respectfully urged. Favorable reconsideration of the application at this time is respectfully requested.

Regarding the examiner's "Response to Arguments," the examiner states that the Cappelli et al. arc discharge could be operated as a corona discharge, but no supporting documentation is proffered. It is respectfully requested that, if the examiner persists in this opinion, supporting art be supplied. Otherwise, the distinction urged in the response to the first Official Action sets apart claims and makes them allowable.

Furthermore, the examiner concludes that it would have been obvious to make the discharge electrode a cathode rather than an anode as taught by Hinchliffe. However, the examiner does not address the fact that Hinchliffe strongly teaches away from the use of a cathode. Nor does the examiner address the unexpected improved results that applicants have had through the use of a cathode rather than an anode as pointed out in applicants' previous response. We urge that it would not have been obvious to make Hinchliffe's anode into a cathode.

In view of the foregoing it is respectfully urged that all the claims now present in this application are allowable over the art of record. Allowance of the application is believed appropriate. Should the examiner wish to discuss this application or have questions or suggestions, the examiner is invited to contact the undersigned attorneys for applicant at the phone number or email address given below.

Respectfully submitted,

GALLAGHER & KENNEDY, P.A.

Date: 6/17/03

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